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TITLE

FOREST INSECT SURVEY - MODOC NATIONAL FOREST
HAPPY CAMP-LAVA BEDS AREA

SEASON OF 1940

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BY
N. D. WYGANT
BERKELEY, CALIFORNIA
JANUARY 16, 1941

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FOREST INSECT LABORATORY
BERKELEY, CALIFORNIA
JANUARY 16, 1941

FOREST INSECT SURVEY - MODOC NATIONAL FOREST
HAPPY CAMP-LAVA BEDS AREA

SEASON OF 1940

APPROVED BY:

J. M. MILLER
SENIOR ENTOMOLOGIST, IN CHARGE

SUBMITTED BY:

N. D. WYGANT
ASSISTANT ENTOMOLOGIST

FOREST INSECT SURVEY - MODOC NATIONAL FOREST
HAPPY CAMP-LAVA BEDS AREA

SEASON OF 1940

INTRODUCTION

THE ANNUAL FOREST INSECT SURVEY OF THE HAPPY CAMP-LAVA BEDS AREA ON THE MODOC NATIONAL FOREST WAS MADE BY THE BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE DURING THE PERIOD FROM OCTOBER 24 TO NOVEMBER 9, 1940. DURING THIS PERIOD A 100 PERCENT CRUISE WAS MADE ON 11 VIRGIN TIMBER AND 2 CUTOVER PLOTS OF 320 ACRES EACH, TO DETERMINE THE 1940 LOSS CAUSED BY THE WESTERN PINE BEETLE, DENDROCTONUS BREVICOMIS LEC., AND OTHER INSECTS. SOME OF THESE PLOTS HAVE BEEN EXAMINED ANNUALLY SINCE 1921 AND PROVIDE THE LONGEST CONTINUOUS PLOT RECORDS OF BARK BEETLE INFESTATION IN THE CALIFORNIA REGION. THE PLOT SURVEYS WERE MADE BY N. D. WYGANT, E. G. LIST, JR., AND F. R. THROOP. K. A. SALMAN ASSISTED IN THE RECONNAISSANCE AND GENERAL ORGANIZATION OF THE SURVEYS.

SINCE THE LAST ANNUAL FOREST INSECT SURVEY REPORT OF THE HAPPY CAMP-LAVA BEDS AREA, A PROGRESS REPORT (1) HAS BEEN PREPARED BY P.C. JOHNSON ON RESULTS OF THE HAZARD INVENTORY SURVEY MADE DURING THE SPRING OF 1939. IN THAT REPORT THE ENTOMOLOGICAL UNIT BOUNDARIES IN THE HAPPY CAMP-LAVA BEDS AREA WERE CHANGED TO SECURE MORE HOMOGENOUS AREAS SO FAR AS HAZARD FROM FOREST INSECT ATTACK IS CONCERNED. THESE NEW UNITS AND BOUNDARIES ARE USED IN THIS REPORT (FIGURE 1).

DURING THE SURVEY PERIOD THE WEATHER WAS UNUSUALLY STORMY. MOST OF THE PLOTS WERE CRUISED DURING OR BETWEEN SNOW AND RAIN STORMS AND UNDER POOR LIGHT CONDITIONS. FOR THAT REASON THE 1940 SURVEY MAY NOT BE AS ACCURATE AS SOME PREVIOUS SURVEYS WHICH WERE CRUISED UNDER MORE FAVORABLE CONDITIONS.

CHARACTERISTICS OF THE 1940 INFESTATION

THE TOTAL INSECT CAUSED LOSS IN 1940 IS ESTIMATED TO HAVE DECREASED 14 PERCENT FROM 1939 ON THE HAPPY CAMP-LAVA BEDS AREA. THE AVERAGE DECREASE ON THE PLOTS WAS ESTIMATED AT 18 PERCENT. THE MOST EVIDENT CHANGE IN THE INFESTATION WAS THE MUCH SMALLER NUMBER OF TREES CONTAINING WINTER BROOD. THIS MAY BE INDICATIVE OF A RATHER SHARP DECLINE IN THE INSECT POPULATION. HOWEVER, IT MAY INDICATE THAT A LARGER THAN USUAL PORTION OF THE SEASONAL LOSS WAS MISSED BECAUSE OF INCLEMENT WEATHER AND ITS EFFECTS ON SPOTTING EFFICIENCY, OR BECAUSE A LARGE NUMBER OF TREES ATTACKED LATE IN THE FALL FAILED TO EXHIBIT ANY SYMPTOMS OF ATTACK WHICH WOULD CAUSE THEM TO BE EXAMINED AND SPOTTED.

THE GROUPING TENDENCY WHICH WAS A NOTICEABLE FEATURE OF THE 1939 INFESTATION DECREASED CONSIDERABLY IN 1940, PARTICULARLY IN THE WINTER BROOD. HOWEVER, AS NOTED BY J. W. JOHNSON (2) THE GROUPING TENDENCY CONTINUED INTO THE SUMMER OF 1940 IN THE BADGER UNIT. THE LARGEST GROUP OF 1940 SUMMER TREES (18 IN NUMBER) WAS CRUISED ON PLOT RS-2 NEAR THE LAVA RANGER STATION.

FLATHEAD INFESTED TREES, JUST STARTING TO FADE, WERE FAIRLY COMMON IN THE BADGER AND TIMBER MOUNTAIN UNITS. ALTHOUGH IT IS PROBABLE THAT MANY OF THESE TREES WILL BE DEAD BY NEXT SPRING, THEY WERE NOT MARKED IN THE CURRENT CRUISE, AS IT WAS NOT CERTAIN THAT THEY WOULD SUCCUMB AS PART OF THE 1940 LOSS.

INSECT CAUSED LOSSES ON VIRGIN SAMPLE PLOTS

THE AVERAGE LOSS ON THE 10 PLOTS IN VIRGIN TIMBER IS ESTIMATED AT 99 BOARD FEET PER ACRE (SEE TABLE 1). THIS REPRESENTS APPROXIMATELY 18 PERCENT DECREASE FROM THE LOSS IN 1939. THE DECREASE OCCURRED FOR THE MOST PART IN THE NORTHERN PART OF THE AREA (BADGER AND TIMBER MOUNTAIN UNITS). THE PLOTS IN THE SOUTHERN HALF OF THE AREA SHOWED PINE MORTALITY EQUAL TO OR GREATER THAN DURING 1939. SEVENTY-FIVE BOARD FEET WAS THE AVERAGE LOSS PER ACRE ON THE NORTHERN PLOTS (MC-3, MC-4, MC-5, MC-6, MC-7 AND RS-5) OR A DROP OF 39 PERCENT FROM 1939. THE AVERAGE LOSS ON THE SOUTHERN PLOTS (RS-2, RS-6, MC-1 AND MC-8) WAS 135 BOARD FEET PER ACRE OR 15 PERCENT INCREASE FROM 1939. AS STATED BEFORE, VERY FEW WINTER TREES WERE FOUND AND IF THIS IS DUE TO THE FACT THAT THE INFESTED TREES HAD NOT STARTED TO FADE AND CONSEQUENTLY WERE MISSED BY THE SURVEY CREW, THE ESTIMATED LOSS FOR 1940 MAY BE TOO LOW.

PINE LOSS ON THE PLOTS VARIED FROM 27 BOARD FEET PER ACRE ON PLOT MC-7 TO 168 BOARD FEET ON PLOT RS-2. THE 1940 LOSS VARIED FROM A 69 PERCENT DECREASE FROM 1939 ON PLOT MC-7 TO A 100 PERCENT INCREASE ON PLOT RS-6.

THE INFESTATION ON PLOT RS-11, WHICH IS IN THE NORTH WARNER AREA AND OUTSIDE THE HAPPY CAMP-LAVA BEDS AREA, REMAINED APPROXIMATELY THE SAME AS THAT OF 1939. THE LOSS PER ACRE WAS 67 BOARD FEET IN 1939 AND 68 BOARD FEET IN 1940. THE TIMBER WAS BEING CUT AT THE TIME OF THE SURVEY, AND THEREFORE THE 1940 LOSS RECORDS WILL BE THE LAST FOR THAT PLOT.

INSECT CAUSED LOSSES ON CUTOVER SAMPLE PLOTS

THE INSECT CAUSED LOSSES FOR THE PAST THREE YEARS ON THE CUTOVER PLOTS ARE SHOWN IN TABLE 3. THE LOSS ON CO-5 WAS 14 BOARD FEET PER ACRE OR 1.4 PERCENT OF THE RESIDUAL STAND AND ON CO-26 APPROXIMATELY 6 BOARD FEET OR 3.1 PERCENT OF THE RESERVE STAND.

THE AVERAGE ANNUAL LOSS ON CUTOVER RESERVE STANDS ON THE AREA AS A WHOLE HAS AVERAGED 0.78 PERCENT OF THE RESERVE STAND ACCORDING TO THE 1939 HAZARD INVENTORY (1).

LOSSES CAUSED BY WIND

CUTOVER PLOT CO-26 WAS STRUCK BY A SEVERE WINDSTORM DURING THE FALL OF 1939 OR SPRING OF 1940. THE WINDFALL LOSS ON THE 320 ACRES WAS 137 TREES OR A TOTAL OF 28,280 BOARD FEET. THIS REPRESENTS 88 BOARD FEET LOST PER ACRE. THE LOSS CAUSED BY WIND ON THE OTHER PLOTS WAS LIGHT.

INSECT CAUSED LOSSES ON INFESTATION UNITS

THE LONG RECORD OF LOSSES THAT HAS BEEN OBTAINED ON THE HAPPY CAMP-LAVA BEDS AREA MAKES IT POSSIBLE TO LOOK BACKWARDS AND JUDGE THE IMPORTANCE OF THE INSECT FACTOR. SINCE 1921, ON AN AREA VARYING FROM 253,000 TO 376,000 ACRES OF VIRGIN TIMBER, IT IS ESTIMATED THAT A TOTAL OF 1,271 MILLION BOARD FEET OF TIMBER HAVE BEEN KILLED BY INSECTS. THE AVERAGE LOSS HAS BEEN ABOUT 63 MILLION BOARD FEET PER YEAR ON THE BASIS OF THESE ANNUAL SURVEY RESULTS. IN 1939 THE HAZARD INVENTORY ESTIMATED THAT ABOUT 900 MILLION BOARD FEET OR 24 PERCENT OF THE ORIGINAL STAND HAD BEEN KILLED DURING THE PAST 12 TO 15 YEARS. IT IS WORTHY OF NOTE THAT THESE TWO ESTIMATES, ARRIVED AT FROM DIFFERENT SOURCES OF DATA, AGREE FAIRLY WELL.

THE IMPLICATIONS OF THE ANNUAL LOSS OF 63 MILLION BOARD FEET PER YEAR ARE VERY SIGNIFICANT IN TERMS OF RESOURCE WASTE AND LOSS OF AVAILABLE FOREST INCOME. IT MUST BE PLAIN TO EVERYONE THAT AN OPPORTUNITY TO USE A LARGE PART OF THE ORIGINAL RESOURCES OF THIS AREA HAS SLIPPED BEYOND OUR REACH. HOWEVER, AN OPPORTUNITY FOR REAL SERVICE STILL EXISTS IF PLANS FOR THE CONTROL OF FOREST INSECTS IN THIS AREA CAN BE APPLIED AS ACTION PROGRAMS DESIGNED TO CONSERVE AND UTILIZE SUCH TIMBER RESOURCES AS NOW REMAIN.

THE ESTIMATED LOSSES ON THE VARIOUS UNITS FOR THE PAST THREE YEARS ARE SHOWN IN TABLE 2. THE PINE LOSS DURING 1940 IS ESTIMATED AT 26,670,000 BOARD FEET.

TIMBER MOUNTAIN: THE ESTIMATED LOSS ON THIS UNIT FOR 1940 IS 3,040,000 BOARD FEET (SEE TABLE 2). THIS REPRESENTS 84 BOARD FEET PER ACRE OR 3.8 PERCENT OF THE RESIDUAL STAND. THE LOSS IS ESTIMATED TO HAVE DROPPED 18 PERCENT FROM 1939. THE CUMULATIVE LOSS ON THIS UNIT HAS BEEN THE HEAVIEST OF ALL UNITS. THE CUMULATIVE LOSS UP TO THE SPRING OF 1939 WAS ESTIMATED BY THE HAZARD INVENTORY (1) TO BE 55 PERCENT OF THE STAND. MUCH OF THE AREA HAS BEEN DEPLETED SO SEVERELY THAT MANY STANDS MUST NOW BE CLASSIFIED AS UNMERCHANTABLE.

BADGER: THE 1940 LOSS ON THE BADGER UNIT IS ESTIMATED AT 4,170,000 BOARD FEET, OR 75 BOARD FEET PER ACRE. THIS REPRESENTS 1.2 PERCENT OF THE RESIDUAL STAND AND A DECREASE IN PINE LOSS FROM 1939 OF 40 PERCENT. THE UNIT HAS ALSO SUSTAINED HEAVY INSECT CAUSED LOSSES IN THE PAST. FORTY-THREE PERCENT OF THE STAND HAD BEEN DEPLETED UP TO THE SPRING OF 1939 (1).

Happy Camp: The 1940 loss on the Happy Camp Unit is estimated at 5,350,000 board feet, or 94 board feet per acre, or a 26 percent decrease in the year's loss from that of 1939. This loss represents approximately 1 percent of the residual stand. The cumulative loss up to 1939 was estimated at 21 percent of the original stand (1).

Webb Butte: The estimated loss on the Webb Butte Unit for 1940 is 8,610,000 board feet, or 149 board feet per acre, or an increase of 13 percent from 1939. The loss on this unit is the heaviest of all, but this year's loss represents only 1.1 percent of the residual stand, and from that viewpoint it is lighter than on some of the other units with sparse stands. The cumulative loss as determined by the Hazard Inventory in the spring of 1939 was 22 percent of the original stand.

Lava Beds: The estimated loss on the Lava Beds unit for 1940 is 5,500,000 board feet, or 117 board feet per acre, or approximately the same as during 1939. This year's loss represents 1.2 percent of the residual stand. The cumulative loss as determined by the Hazard Inventory in the spring of 1939 was 18 percent of the original stand.

Glass Mountain: No estimate of loss on the Glass Mountain Unit is attempted because of the lack of data applicable to that unit. Most of this unit is now cutover.

Buck Creek: No estimate of loss on the Buck Creek Unit of the North Warner Area is made because the timber on this area is now being cut.

SUMMARY

The 1940 annual forest insect survey of the Happy Camp-Lava Beds Area on the Modoc National Forest was made October 24 to November 9, 1940. The total volume of pine killed by insects was estimated at 26,670,000 board feet. This represents a decrease in loss from 1939 of approximately 14 percent. A smaller number of trees containing the winter brood was found than was expected. This may be due either to a decline in the infestation or to the failure of the survey crew to spot the winter brood trees that may not have started to fade. The grouping tendency decreased particularly in the winter trees. The four sample plots in the southern half of the area showed pine mortality equal to or greater than that of 1939. The six plots in the northern part of the area showed a drop of approximately 39 percent from 1939.

RECOMMENDATIONS

Although the loss this season is greater in the central and southern portions of the Happy Camp-Lava Beds Area, there appear to be no centers of epidemic infestation which warrant the use of direct control measures. However, the continuation of heavy annual losses, which

IN 1940 ARE ESTIMATED TO AMOUNT TO ABOUT 26,670,000 BOARD FEET, EMPHASIZES THE NEED FOR SOME MEANS OF CONTROL OR MEASURES TO UTILIZE THE TIMBER THAT NOW IS BEING KILLED BY INSECTS.

LIQUIDATION OF PRIVATE TIMBER RESOURCES IS NOW GOING ON RAPIDLY. HOWEVER, EVEN AT ITS PRESENT RATE, UTILIZATION OF MERCHANTABLE VALUES WILL TAKE A PERIOD OF YEARS DURING WHICH THE HEAVY LOSSES WILL PROBABLY CONTINUE TO BE SUFFERED IN THE VIRGIN STANDS. THE HAZARD INVENTORY HAS SHOWN THAT ABOUT 78 PERCENT OF THE AREA IS HIGHLY HAZARDOUS AND THAT INSECTS ARE MORE THAN A MODERATE HAZARD IN OVER 97 PERCENT OF THE AREA. THIS CONDITION CALLS FOR AN IMMEDIATE ACTION PROGRAM.

THE FOREST INSECT LABORATORY AT BERKELEY, CALIFORNIA RECOMMENDS THAT SUCH A PROGRAM INCLUDE PROVISIONS FOR A QUICK SALVAGE-SANITATION CUT TO CONTROL THE INFESTATION, REDUCE THE LOSS, AND REMOVE HIGHLY SUSCEPTIBLE MATERIAL FROM THE STANDS. IT OFFERS ITS COOPERATION IN DEVELOPING SUCH A CONTROL PROGRAM.

REFERENCES

(1) JOHNSON, P. C.

FOREST INSECT HAZARD INVENTORY, PROGRESS REPORT: HAPPY CAMP-LAVA BEDS AREA, CALIFORNIA.
UNPUBLISHED OFFICE REPORT, APRIL 29, 1940.

(2) JOHNSON, J. W.

COMPOSITION STUDIES OF THE 1940 SEASON, MODOC NATIONAL FOREST.
UNPUBLISHED OFFICE REPORT, DECEMBER 17, 1940.

TABLE 1. INSECT CAUSED LOSSES IN VIRGIN SAMPLE PLOTS - MODOC NATIONAL FOREST

HAPPY CAMP-LAVA BEDS AREA

PLOT No.	1938 PER SECTION No. TREES	1938 PER SECTION VOLUME B.M.	1938 PER A. VOLUME B.M.	1938 RATIO 38/37	1939 PER SECTION No. TREES	1939 PER SECTION VOLUME B.M.	1939 PER A. VOLUME B.M.	1939 RATIO 39/38	1940 (ESTIMATED) PER SECTION No. TREES	1940 (ESTIMATED) PER SECTION VOLUME B.M.	1940 (ESTIMATED) PER A. VOLUME B.M.	1940 (ESTIMATED) RATIO 40/39
RS-2	64	64,950	101	1.5	140	118,500	185	1.8	121	107,318	168	0.9
RS-5	92	46,230	72	0.7	128	83,500	130	1.8	57	53,715	84	0.6
RS-6	104	61,270	96	1.2	58	35,240	55	0.6	101	71,019	111	2.0
MC-1	120	79,350	124	1.5	104	63,260	99	0.8	126	84,014	131	1.3
MC-3	148	100,650	157	0.7	112	99,620	156	1.0	40	39,241	61	0.4
MC-4	202	43,670	68	0.7	158	102,720	161	2.4	108	106,075	166	1.0
MC-5	44	27,980	44	2.0	26	39,260	61	1.4	30	33,191	52	0.8
MC-6	26	23,420	37	0.6	74	89,860	140	3.8	52	39,066	61	0.4
MC-7	46	30,550	48	0.5	74	56,300	88	1.8	24	17,569	27	0.3
MC-8	38	36,640	57	0.8	82	82,540	129	2.3	64	83,104	130	1.0
AVER.	88	51,471	80	0.9	96	77,080	120	1.5	72	63,431	99	0.8
NORTH WARNER AREA												
RS-11	96	120,190	188	2.3	42	42,560	67	0.4	34	43,776	68	1.0

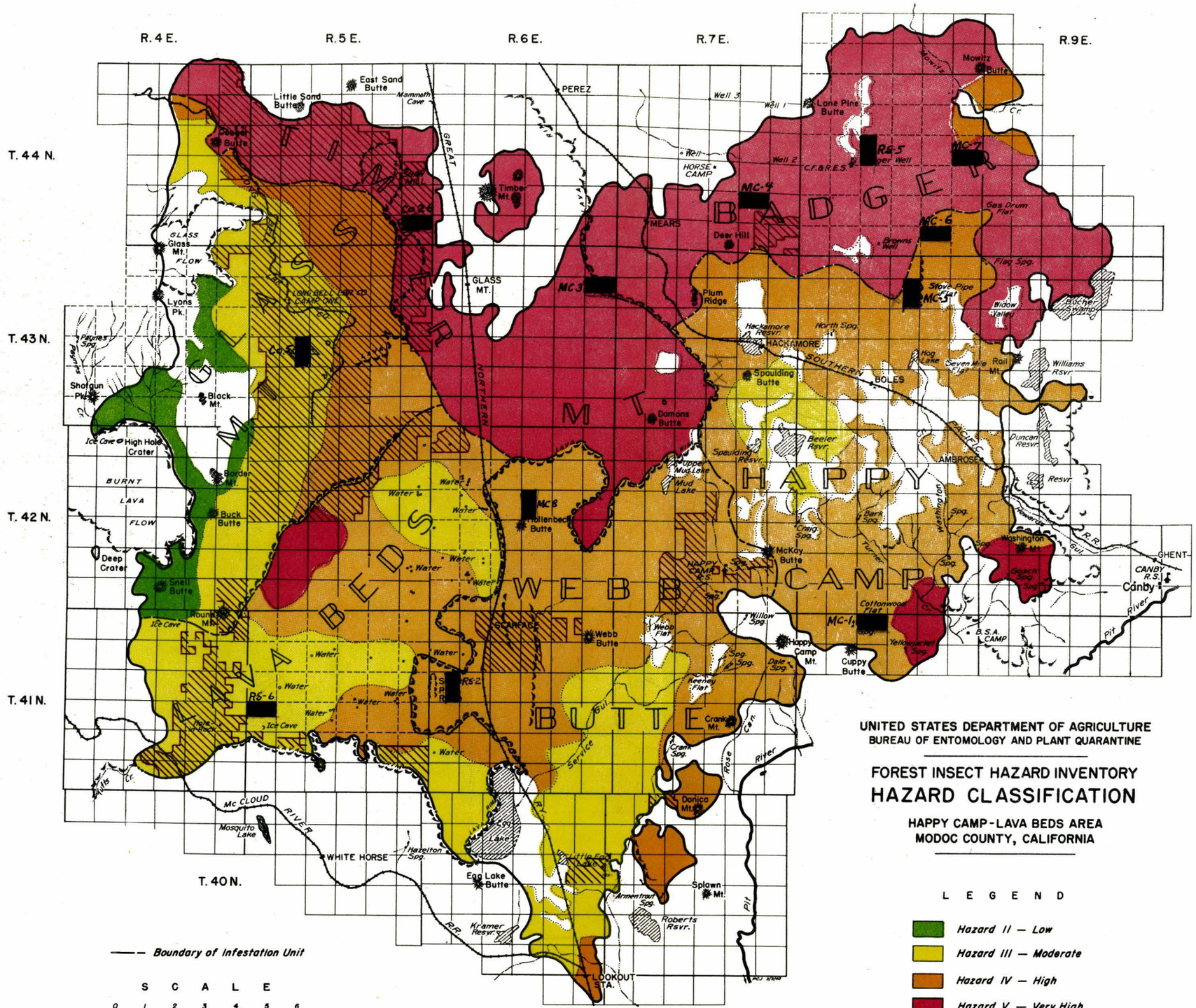
TABLE 2. INSECT CAUSED LOSSES ON INFESTATION UNITS
MODOC NATIONAL FOREST

UNIT	VIRGIN TIMBERED ACREAGE*	RESIDUAL STAND M.B.M.*	1938		1939		1940	
			NO. TREES	VOLUME M.B.M.	NO. TREES	VOLUME M.B.M.	NO. TREES	VOLUME M.B.M.
TIMBER MTN.	36,100	30,323	4,700	3,690	4,870	3,730	2,710	3,040
BADGER	55,350	375,686	8,090	6,430	8,390	6,990	4,490	4,170
HAPPY CAMP	57,040	560,879	8,420	6,690	8,740	7,270	7,440	5,350
WEBB BUTTE	57,910	801,252	6,870	6,270	9,380	7,600	8,380	8,610
LAVA BEDS	46,850	452,789	6,240	4,900	6,460	5,230	6,490	5,500
TOTALS	253,150	2,270,929	34,320	27,980	37,840	30,820	29,510	26,670

* FIGURES AS OF JANUARY 1, 1939.

TABLE 3. INSECT CAUSED LOSSES ON CUTOVER SAMPLE PLOTS
MODOC NATIONAL FOREST

PLOT NO.	RESIDUAL STAND 1936	1938			1939			1940 (ESTIMATED)		
		PER SECTION		PER A.	PER SECTION		PER A.	PER SECTION		PER A.
		NO. TREES	VOLUME B.M.	VOLUME B.M.	NO. TREES	VOLUME B.M.	VOLUME B.M.	NO. TREES	VOLUME B.M.	VOLUME B.M.
CO-5	1,015	34	4,110	6	78	13,220	21	60	8,932	14
CO-26	194	42	5,540	9	62	9,700	15	20	3,762	6


R. 4 E.
R. 5 E.
R. 6 E.
R. 7 E.
R. 9 E.
T. 44 N.
T. 43 N.
T. 42 N.
T. 41 N.
T. 40 N.
TIMBER MT.
BADGER
HAPPY CAMP
WEBB BUTTE
LAVA BEDS
East Sand Butte
Little Sand Butte
Mammoth Cave
PEREZ
Well 3
Well 1
Well 2
C.F.B.R.E.S.
HORSE CAMP
Mowitz Butte
Lone Pine Butte
RS-5
MC-7
MC-4
MC-6
MC-5
MC-3
MC-8
MC-1
RS-2
RS-6
Timber Mt.
Deer Hill
MEARS
Gas Drum Flat
Flag Spg.
Stove Pipe Flat
Widow Valley
Butcher Swamp
GLASS MT.
Plum Ridge
Hackamore Resvr.
HACKAMORE
North Spg.
Hog Lake
Seven Mile Flat
Rail Mt.
Williams Resvr.
Spaulding Butte
BOLES
Damons Butte
Beeler Resvr.
Duncan Resvr.
Spaulding Resvr.
Upper Mud Lake
Mud Lake
AMBROSE
Craig Spg.
Bar Spg.
Washington
Washington Mt.
Gosch Spg.
McKay Butte
Happy Camp
Happy Camp Mt.
Cuppy Butte
Cottonwood Flat
Yellowjacket Spg.
Willow Spg.
Webb Flat
Webb Butte
Scarface
Keeney Flat
Dale Spg.
Cranks Mt.
Crank Spg.
Donica Mt.
Splawn Mt.
Armentrout Spg.
Roberts Rsvr.
Kramer Resvr.
LOOKOUT STA.
Egg Lake Butte
Hazelton Spg.
WHITE HORSE
Mosquito Lake
Mc CLOUD RIVER
Little Egg Lake
Glass Mt.
Lyons Pk.
Shotgun Pk.
Black Mt.
High Hole Crater
Ice Cave
Border Mt.
Buck Butte
Deep Crater
Snell Butte
Round Mt.
Hole in Rock
Ice Cave
Squaw Valley Cr.
Water
Spg.
Lake
Ice Cave
Ice Cave
Ice Cave